2.0 REMEDIATION OBJECTIVES AND APPROACH

2.1 Introduction

The overall Feasibility Study objective is to develop cost-effective remedial alternatives that will be protective of public health and the environment. The developed alternatives must achieve compliance with the applicable or relevant and appropriate requirements (ARARs) and maintain long-term effectiveness through reduction in contaminant toxicity, mobility, and volume. The remedial goals established in this section for the site would be accomplished through (1) reduction in source volume, (2) reduction in off-site migration potential, and/or (3) reduction in potential exposures.

All major sources of risk and exposure pathways identified in the Human Health and Ecological Risk Assessments (M&E, 2001; TRC, 2001) were reviewed to develop remedial alternatives. The target residual risk at the site boundary, 10^{-4} to 10^{-6} in accordance with the NCP framework, would be achieved through a combination of initiatives: source reduction, treatment, engineering and institutional controls, as well as monitoring with ground water wells that would provide advance information about potential off-site migration.

The purpose of the FS is to develop a range of remedial alternatives to achieve the remedial objectives for the site. The alternatives development process consists of the following general steps.

- Develop remedial action objectives for contaminated buried wastes, soil, and ground water that permit a range of treatment and containment alternatives. The development of remedial action objectives is based upon contaminant-specific ARARs and risk-based cleanup criteria.

- Identify general response actions that would achieve the remedial action objectives for the contaminated buried wastes, soil, and ground water. A general response action is the broadest classification of the remedial action and includes such groupings as treatment, disposal, and containment.

- Identify the extent of contaminated buried wastes, soil, and ground water to which general response actions might need to be applied. Identify volumes of media that require remediation with consideration given to the requirements for protectiveness, as identified by the remedial action objectives, and the chemical and physical characteristics of the site.

- Identify technology categories that may feasibly achieve the goal of each general response action. This process, referred to as "initial screening," serves to identify potentially applicable technologies and to eliminate technologies that are clearly not implementable at the site or would not be effective in treating site contamination.

- Identify and evaluate technology options to retain a representative process for each technology category for further consideration. This process is intended to represent the broader range of process options within a general technology type and represents secondary

screening of technologies. If possible, a single process option is selected to be representative of the potentially applicable process options identified for each general response action.

- Assemble the preferred technology options into alternatives that represent the range of general response actions.

- Following development of the alternatives, screen each alternative based on cost, effectiveness, and implementability. The objective of this screening is to reduce the number of alternatives that would undergo detailed evaluation by eliminating less preferable alternatives.

2.2 Regulatory Requirements

During the Feasibility Study process, an analysis is made of legal and policy requirements that could affect the implementation of remedial alternatives. These institutional issues consist mainly of the compliance of each proposed remedial alternative with applicable or relevant and appropriate federal, state, and local public health and environmental requirements (ARARs). Determination of ARARs is site-specific and depends on the chemical contaminants, site/location characteristics, and remedial actions being investigated for site cleanup. Consideration of ARARs is undertaken to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, the National Contingency Plan (NCP), and other requirements of laws that must be addressed by the EPA or parties undertaking the remedial action. In the "Detailed Evaluation of Alternatives" section, each alternative is evaluated with respect to its compliance with the ARARs identified below.

CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA, October 1986), governs the liability, cleanup, financial responsibility, and response for hazardous substances released into the environment. CERCLA requires that all remedial actions be consistent with the NCP. The NCP, published as 40 CFR Part 300, specifies procedures, techniques, materials, equipment, and methods to be employed in identifying, removing, or remedying releases of hazardous substances. In particular, the NCP specifies procedures for determining the appropriate type and extent of remedial action at a site in order to effectively mitigate and minimize damage to, and provide adequate protection of, public health, welfare, and the environment.

The national goal of remedy selection is to protect human health and the environment, to maintain that protection over time, and to minimize untreated waste (40 CFR Part 300.430 of the NCP (55 FR 8846)). In accordance with Section 121(d) of CERCLA, site remediation must comply with all applicable or relevant and appropriate laws, regulations, and standards promulgated by the federal government, except where waived. State requirements must also be attained, under Section 121(d)(2)(c), if they are legally enforceable and consistently enforced statewide, and if the state ARAR is more stringent than the federal ARAR and has been presented to the EPA in a timely manner. Waiver conditions that may be used, if protection of human health and the environment is to be ensured, include the following.

- The remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed.

- Compliance with such requirements is technically impracticable from an engineering perspective.

- Compliance with such requirement at that facility will result in greater risk to human health and the environment than alternative options.

- The remedial action selected will attain, through use of another method or approach, a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation.

- In the case of a remedial action to be undertaken solely under Section 104, selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration, and the availability of money from the fund to respond to other sites, taking into consideration the relative immediacy of such threats.

- With respect to a state standard, requirement, criteria, or limitation, the state has not consistently applied (or demonstrated the intention to consistently apply) the standard, requirement, criteria, or limitation in similar circumstances at other remedial action sites within the state.

The NCP defines "applicable" and "relevant and appropriate" requirements. Applicable requirements consist of those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. In addition, other environmental and public health guidelines, although not ARARs, may be considered to help determine what is protective or to determine CERCLA remedies. These guidelines are termed "to be considered" (TBC).

CERCLA Section 121(e), codified at 40 CFR Part 300.400(e), exempts any response action conducted entirely at the site from having to obtain a federal, state, or local permit, where the action is carried out in compliance with Section 121. Remedial actions conducted on Superfund sites need comply only with the substantive aspects of ARARs and not with the corresponding administrative requirements.

Identification of potential ARARs to be considered for the Site and adjacent wetland areas are organized into three categories, following EPAs CERCLA Compliance with Other Laws Manual (Interim Final -- EPA/540/G-89/006, Part II -- EPA/540/G-89/009 guidance (U.S. EPA, 1988 and 1989):

- Chemical-specific
- Location-specific
- Action-specific

Appendix A presents tables of areas for this Site. Each potential ARAR was reviewed to evaluate the potential applicability or relevancy and appropriateness according to the procedures identified in CERCLA Compliance with Other Laws Manual (OSWER Directive 9234.1-01), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (OSWER Directive 9355.3-01), and RCRA, Superfund & EPCRA Hotline Training Module: Introduction to Applicable or Relevant and Appropriate Requirements (OSWER 9205.5-10A).

2.2.1 Chemical-Specific ARARs

Chemical-specific ARARs provide criteria for evaluating concentrations of specific hazardous contaminants. They are developed based upon the protection of human health and the environment. These values establish the acceptable amount or concentration of a chemical that may be found in or discharged to the environment. Federal and state laws, which may be potential chemical-specific ARARs or TBCs, are summarized in Appendix A and include the following.

- Federal Safe Drinking Water Act, MCLs and MCLGs
- Federal Clean Water Act Ambient Water Quality Criteria (AWQC)
- Federal Clean Air Act, National Ambient Air Quality Standards (NAAQS)
- Vermont Ground Water Protection Rule and Strategy
- Vermont Water Supply Rule and Drinking Water Guidance
- Vermont Water Quality Standards
- Vermont Air Pollution Control Regulations and Hazardous Ambient Air Concentrations
- Federal Criteria and Advisories To Be Considered

A discussion of the applicability or relevancy and appropriateness of each of the potential ARARs or criteria to be considered listed above is provided in this section.

Safe Drinking Water Act: The Safe Drinking Water Act (SDWA) of 1974, most recently amended in 1996, was established to protect public drinking water supplies. The major elements of the drinking water program include:

- Drinking water standards and treatment techniques
- Filtration and disinfection of surface supplies and disinfection by-product standards
- Coliform rule
- Radionuclide standards

Section 1424(e) of the SDWA authorizes EPA to determine that an aquifer is the "sole or principal" source of drinking water for an area.

Section 1412 of the SDWA requires the EPA to publish MCLGs and promulgate national drinking water regulations. Under Section 1401, EPA must develop enforceable MCLs and "criteria and procedures to assure a supply of drinking water which dependably complies" with such MCLs. Under Section 1412(b)(7)(a), the use of a best available treatment technique instead of attainment of an MCL is allowed if it is not technically or economically feasible to ascertain the level of a contaminant in drinking water. Primary Drinking Water Regulations are set forth under 40 CFR Part 141 while 40 CFR Part 142 supplies National Primary Drinking Water Implementation Regulations and 40 CFR Part 143 provides National Secondary Drinking Water Regulations. 40 CFR Part 141 Subparts B and F specify MCLs and MCLGs.

MCLs are enforceable chemical-specific drinking water standards, developed under the SDWA. MCLs are based on the use of best technology, treatment techniques, and other factors, including cost. MCLGs are based entirely on health considerations and do not take cost or feasibility into account. MCLGs are set at levels which will result in no known or anticipated health effects, keeping a margin of safety.

Vermont drinking water regulations are found within the Water Supply Rule (EPR Chapter 21, Subchapter 6) and the Public Water Supply Rule (EPR Chapter 26) and apply to public drinking water supply systems. Maximum Contaminant Levels and Maximum Contaminant Level Goals are specified for inorganic and organic chemicals. Since Site ground water is not used as a public drinking water supply, the criteria are not applicable. However, since Site ground water is classified as potable, the MCLs are relevant and appropriate for Site ground water. Since the Site is adjacent to and upgradient of ground water which is a potential drinking water supply, MCLs and non-zero MCLGs are relevant and appropriate to off-site ground water. MCLGs set at zero are to be considered.

Vermont Department of Health Drinking Water Guidance (October 2000) lists the Vermont Action Levels (VALs) and Vermont Health Advisories (VHAs) for chemicals of concern in drinking water. Vermont Action Levels are used with eight chemicals of specific public health concern in public water systems. Action Levels as established by the Department of Health are the concentrations at or above which a specific (priority) procedure will be followed to provide public health protection.

Vermont Health Advisories are researched and calculated concentrations of chemicals in drinking water in instances where the chemicals do not have an MCL. The Vermont Health Advisories are a tool for risk assessment and should provide a margin of safety to people consuming water below these levels. If an advisory is exceeded, it does not necessarily follow that adverse health effects will occur, but that further evaluation of the water supply is warranted.

Federal Water Pollution Control Act, as Amended by the Clean Water Act, Ambient Water Quality Criteria and Vermont Water Quality Standards adopted under Vermont Water Pollution Control Act, 10 V.S.A. Chapter 47 (EPR Chapter 1): The Federal Water Pollution Control Act as amended by the Clean Water Act (referred to as the Clean Water Act or CWA) seeks to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (40 CFR 101(a)). Vermont's equivalent rules are the Vermont Water Quality Standards adopted under Vermont Water Pollution Control Act, 10 V.S.A. Chapter 47 (EPR Chapter 1).

The CWA, as amended, sets forth ambient water quality criteria for the protection of freshwater aquatic life and human health (authorized under CWA Section 304(a)(1) and regulated under 40 CFR 120). Water quality standards are based on the designated use(s) for the water, and the criteria necessary to protect the designated use(s). Federal AWQC developed under Section 304(a) of the CWA are unenforceable guidance criteria based on the latest scientific information to evaluate the effect a toxic pollutant concentration has on a particular aquatic species and/or human health. There are both proposed and final AWQC. With regards to human exposure, there are two categories to consider: ingestion of both contaminated drinking water and contaminated fish, and ingestion of contaminated fish alone. Although AWQC are nonenforceable, and thus cannot be applicable, Section 121 of CERCLA states that remedial actions shall attain AWQC where they are relevant and appropriate. In determining if AWQC are relevant and appropriate, the primary factors to consider are the designated or potential uses of the water, the media affected, the purposes for which the potential requirement are intended and the latest information available.

The AWQC may be relevant and appropriate for the wetlands identified on Site when protection of aquatic life is a concern or human exposure from consumption of fish a concern.

Under the CWA, every state is required to classify waters within its boundaries according to its intended use, establish antidegradation requirements, and develop water quality standards. The Vermont Water Quality Standards, designated under EPR 12-101et. seq., are based on this requirement. The Vermont Water Quality Standards classify freshwater surface waters as Class A, B, or C based on the most sensitive water uses to be achieved and protected. The rules set general criteria for aquatic habitat, aesthetics, nutrients, and mixing zones for all surface waters of the state. In addition, class-specific criteria are set for dissolved oxygen, temperature, nutrients, pH, solids, oil, grease, turbidity, fecal coliform bacteria, color, and tastes and odor. The bulk of the Hoosic River represents a Class B Water as defined by the Vermont Water Resources Board. Class B waters have an objective of providing water quality that consistently exhibits good aesthetic value and provide high quality habitat for aquatic biota, fish and wildlife. The Hoosic River is also classified as a Cold Water Fish Habitat. However, within the watersheds of Pownal and North Pownal, the Hoosic River classification is Class 1B or A2, based on surface drinking water supplies. According to Vermont Water Quality Standards

adopted June 10, 1999 and effective July 2, 2000, all waters within the Hoosic River basin are Class B except as provided for below.

- **Village of Pownal water supply**. That portion of unnamed tributaries and their watersheds on Mann Hill in the Town of Pownal upstream of the water intake in Oak Hill Cemetery.

  - Unnamed tributaries, Class A2, 3/6/59
  - Reservoir Hollow Brook and Ladd Brook, Class A2, 3/6/59

- **Village of North Pownal water supply**. Reservoir Hollow Brook and all waters within its watershed. (Reservoir is approximately 0.5 mile upstream of the Hoosic River).

- **Village of Pownal water supply**. Ladd Brook and all waters within its watershed in the Town of Pownal.

Water Quality Standards are considered applicable to Site surface waters.

The human health risk assessment identified health risks from current ingestion of ground water both on- and off-site. Evaluation of surface water indicates a potential risk to benthic invertebrates and the little brown bat. Risks from soil, sludge, or sediment were indicated for both human health and wildlife receptors. These potential risks included wading and dermal contact by humans, and direct contact and ingestion by wildlife receptors. For this reason, freshwater acute and chronic AWQC for the protection of aquatic life are considered appropriate and relevant for the Site wetlands.

Clean Air Act and Vermont Air Pollution Control Regulations: The federal Clean Air Act directs EPA to establish national primary and secondary ambient air quality standards. National primary ambient air quality standards define levels of air quality that EPA judges necessary to protect the public health with an adequate margin of safety. National secondary ambient air quality standards define levels of air quality that EPA judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The corresponding Vermont standards are found at EPR Chapter 5.

Of the six air contaminants for which standards have been established for specific sources, only particulate matter may be of concern at this Site. The level of the national primary and secondary 24-hour ambient air quality standards for particulate matter is 150 micrograms per cubic meter (mg/m^3), 24-hour average concentration. The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 mg/m^3, as determined in accordance with appendix K to this part, is equal to or less than one. The level of the national primary and secondary annual standards for particulate matter is 50 micrograms per cubic meter (mg/m^3), annual arithmetic mean. The standards are attained when the expected annual arithmetic mean concentration, as determined in accordance with appendix K to this part, is less than or equal to 50 mg/m^3.

Vermont Ground Water Protection Rule and Strategy: Vermont Ground Water Protection Rule and Strategy, adopted under 10 V.S.A §1390-1394 (EPR 12-101et. seq.) Ground Water Quality Standards establishes ground water classifications, water quality criteria necessary to sustain the designated uses, and regulations necessary to achieve the designated uses or maintain the existing ground water quality. All ground water within the state is designated as Class III, potential water supply, unless otherwise designated by petition. Ground water at the Pownal Tannery Site is Class III, fresh ground waters designated as a source of potable water supply. The Ground Water Protection Rules also specify standards for discharging wastes or effluent into ground water, and requires the Vermont Department of Environmental Conservation to establish discharge limits.

Federal Criteria and Advisories To Be Considered: In addition to the ARARs listed above, there are other important issues and advisories, which will require attention prior to and during remedial activities. These criteria and advisories to be considered include the following.

- ***Health Advisories*** are generated by the EPA Office of Drinking Water and are estimates of risk due to consumption of contaminated drinking water, based on non-carcinogenic risk.

- ***Slope Factors and Unit Risks***: Carcinogenic slope factors and unit risks are developed by the EPA Carcinogenic Assessment Group (CAG) from health effects studies using epidemiological data or from animal testing. Slope factors and unit risks for various carcinogens provide a measure of the strength of a carcinogen; many are available from IRIS. Unit risks may be used to develop target concentrations to correspond to a selected acceptable risk.

- ***Federal Ground Water Protection Strategy of 1984***: The EPA developed the Ground Water Protection Strategy in 1984 with the goal of organizing and coordinating the various programs that protect ground water. The ground water protection strategy lists several policy statements that emphasize the protection of ground water resources. The strategy is not a promulgated requirement and, therefore, cannot be a potential ARAR; it does, however, list several policy statements to be considered when developing a protective remedy. To help achieve consistency among programs, ground water classification guidelines were developed to distinguish between different ground waters meriting different levels of protection. Class I ground waters are “special ground waters” that are highly vulnerable and are either irreplaceable or ecologically vital. Class II ground waters are current and potential sources of drinking water and waters having other beneficial uses. Class II ground waters are estimated to comprise 84 to 94% of the nation's ground water. Class III ground waters are those that cannot be used for drinking water due to high salinity or widespread naturally occurring contamination.

- ***Threshold Limit Values (TLVs).*** TLVs refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed to day after day without adverse health effects.

2.2.2 Location-Specific ARARs

Location-specific ARARs must be considered when developing the FS as these types of ARARs may affect or restrict remediation and site activities. Generally, location-specific requirements serve to protect individual Site characteristics, resources, and specific environmental features on a site. The following Federal and state laws, which pertain to the protection of resources and are potential ARARs or criteria TBC for the Site are described below and summarized in Appendix A.

- Clean Water Act (33 U.S.C. §1251 to 1387), Section 404 and Guidelines for Specification of Disposal Sites of Dredged or Fill Material (33 U.S.C. §1344), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403)
- Executive Order No. 11990, Wetlands Protection
- Executive Order 11988, Floodplain Protection
- Statement of Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, Appendix A)
- Federal Fish & Wildlife Coordination Act (16 U.S.C. §661-666c)
- Federal Archaeological and Historical Preservation Act of 1974, National Historical Preservation Act of 1966 (16 U.S.C. §470), Archaeological and Historical Protection
- Vermont Wetlands Rules
- Vermont Endangered Species and Habitat
- Vermont Stream Alteration
- Vermont Solid Waste Management Rules, location requirements
- Pownal Zoning Bylaws

Clean Water Act, Rivers and Harbors Act of 1899 (33 U.S.C. §403) and Guidelines for Specification of Disposal Sites of Dredged or Fill Material (33 U.S.C. §1344): Section 10 of the Rivers and Harbors Act of 1899 requires a permit for construction of structures on or affecting navigable waters of the U.S. For the permit to be issued, the action must not obstruct or alter navigable waters, present a significant adverse effect on the aquatic environment, or result in violations of water quality criteria. Rivers and Harbors Act requirements are addressed by Clean Water Act regulations. Section 404 of the CWA prohibits discharge of dredged or fill materials into navigable waters of the U.S., including wetlands, without a permit. Under CERCLA, as amended by SARA, remedial activities on a federal Superfund site must comply with the substantive requirements of federal and state laws, regulations, and standards, although actual permits do not need to be obtained or filed. For wetlands, these would include the

provisions of the CWA (Section 404). Section 404 prescribes avoidable impacts on aquatic environments and prohibits significant adverse impacts to the aquatic environment. Wetland replication (on a no-net-loss basis) or restoration would be required as mitigation under these regulations if impacts were unavoidable.

If there is a practicable alternative to the discharge which would have a less adverse impact on the aquatic ecosystem it should be implemented, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged materials on the aquatic ecosystem, pursuant to 40 CFR §230.10(a). These guidelines, contained at 40 CFR Part 230 and developed under CWA Sections 404(b)(1) and 501(a), delineate procedures to evaluate the potential impacts of fill material on aquatic ecosystems. These procedures are followed to the extent that a remedial alternative has a potential to adversely affect a river, pond, or wetland on the Site, and are applicable for the Site.

Statement of Procedures on Floodplain Management and Wetland Protection: EPA policy for carrying out the provisions of Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) are set forth in 40 CFR Part 6, Appendix A. These policies are discussed below.

- Floodplain Management: Executive Order 11988 directs federal agencies to avoid long- and short-term adverse impacts associated with occupancy and modification of flood plains. Agencies responsible for providing federal assistance for construction and improvements and for conducting programs affecting land use must take actions to accomplish the following:

  - Reduce risk of flood loss

  - Minimize the impacts of floods on human safety, health and welfare

  - Restore and preserve the natural and beneficial values served by flood plains

  Most of the requirements associated with the order are set forth in the Floodplain Management Guideline, published February 10, 1978, by the Water Resource Council to aid federal agencies in complying with the order. These guidelines include alternative evaluation, impact assessment and mitigation, and public involvement that are already incorporated into the FS process. The only additional substantive requirement contained within these guidelines is that certain projects or portions may be designated as a critical action, which is any activity for which even a slight chance of flooding would be too great. In the case of critical actions, the area requiring consideration is expanded from the 100-year to the 500-year floodplain. EPA indicated in the CERCLA/SARA Environmental Review Manual (January 1988) that all CERCLA/SARA actions are to be considered critical actions and, therefore, the 500-year floodplain is considered potentially applicable.

Floodplain management guidelines are considered applicable for those portions of the Site that are in the 100-year floodplain.

- ***Protection of Wetlands***: Executive Order 11990 directs federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands. To preserve and enhance the natural and beneficial values of remediation, potential wetlands in the area must be evaluated. Wetland protection requirements include assessing the impacts of any Proposed actions on the wetlands, evaluating alternatives and their potential effects on the wetlands, and identifying mitigative measures to minimize potential harm to the wetlands. These requirements are included within the FS process and therefore do not result in any additional requirements.

  Wetlands are defined as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (33 CFR §323.2(c)). As portions of the Site contain wetlands, protection of wetlands requirements are applicable.

Fish and Wildlife Coordination Act (16 U.S.C. §661 et seq.): The Fish and Wildlife Coordination Act (FWCA) requires that agencies be consulted and their recommendations be given "full consideration" taken to protect fish and wildlife that may be impacted by diversion, channeling, or other activities that modify a river or stream (16 U.S.C. §662). Specifically, the FWCA, along with the Conservation Act and other advisories, requires federal agencies issuing a permit to modify any off-site body of water to consult with federal and state wildlife agencies to ensure that resources are appropriately protected and that measures are developed to prevent, mitigate, or compensate for losses to fish and wildlife. Consultation and coordination with a number of state and federal agencies would be necessary for those alternatives which may impact area water bodies to prevent, mitigate, or compensate for project-related losses of fish or wildlife. This includes Vermont's Department of Fish and Wildlife.

Throughout the identification, screening, and evaluation of alternatives, the impacts on fish, wildlife, and their habitat are evaluated and mitigation measures that would be employed are discussed.

Vermont Endangered Species Act (10 V.S.A. Chap. 123): These regulations establish the state's list of threatened and endangered species and rare and uncommon species of special concern. Habitat of such species is protected. The Endangered Species Act requires actions to be taken that will conserve identified local endangered or threatened species of fish, wildlife, and plants and the significant habitats for these species. Actions must be taken to ensure that the continued existence of endangered or threatened species is not jeopardized, or significant habitat adversely modified or destroyed. Activity that constitutes an alteration of a significant habitat without a permit is not allowed. Notice of proposed activities in significant habitats must be made to VTDEC. The US Fish and Wildlife Service and the State of Vermont indicated that there are no known rare or endangered species in the Hoosic River. The requirements of this Act are considered applicable.

Federal Archaeological and Historical Preservation Act (16 U.S.C. §469-469c-1); Federal Historic Sites Building and Antiquities Act (16 U.S.C. §461 to 467); National Historic Preservation Act of 1966, Pub. I., No. 89-665, 80 State. 915 (codified as amended in scattered sections of U.S.C.): Several statutes govern the preservation of historic, scientific and archaeological sites. EPA policy in complying with such statues is presented in the National Environmental Policy Act, Subpart C.

Under the Archaeological and Historical Preservation Act (AHPA) of 1974, the Department of the Interior is authorized to undertake data recovery and preservation if an EPA activity may cause irreparable losses or destruction of scientific, prehistoric, or archaeological data. The AHPA also established procedures for preservation of historic and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program (16 U.S.C. §469).

Under the Historic Sites Act of 1935, certain areas are designated as national natural landmarks by the Secretary of the Interior.

Under the National Historical Preservation Act (NHPA) of 1966 and Executive Order 11593, 30 CFR 800, EPA must consider the impact of actions on property that is listed or eligible for listing on the National Register of Historic Places. The NHPA also requires that for any alteration of terrain that may cause irreparable harm, loss, or destruction of significant artifacts or prehistorical, historical, or archaeological data, the project proponent is required to recover and preserve the artifacts and/or data.

A cultural Resources study was conducted, indicating no national historic or archaeologic sites in the vicinity of the Site (Appendix F). This requirement is potentially applicable to any excavation on-site.

Vermont Wetlands Protection Rules: Vermont Wetlands Rules (10 VSA, Chapter 37) were promulgated pursuant to the Wetlands Protection Act. The regulations set forth a review and decision-making process to regulate activities in these areas in order to contribute to the interests of drinking water supplies, flood control and storm damage protection, pollution prevention, shellfish, fisheries, and wildlife protection. The regulations apply to wetlands and to perennial rivers and streams. Activities in these areas or their buffer zones (within 100 feet) require filing of a notice of intent, followed by public hearings. The regulations set performance standards for activities occurring in these areas which include banks, bordering vegetated wetlands, open water, land subject to flooding, and streambanks. Wetland functions and values requiring protection include, but are not limited to, the following.

- Protection of life and/or property from flooding or flood flows by retaining, storing, metering, or slowing flood waters from storm events.

- Providing and maintaining surface and/or ground water supplies by acting as a recharge or discharge area.

- Providing and maintaining valuable wildlife habitats.

- Providing and maintaining high value recreation areas.

- Protecting and maintaining water quality.

These rules would apply to any remedial action that would impact open water, wetland areas, and any area within 100 feet of these areas.

The State of Vermont determined that these wetlands are not significant and would not need to be replaced if destroyed during remedial activities (Appendix E).

Vermont Historic Preservation Act: The Historic Preservation Act (22 VSA, Chapter 14), applies to projects which are state-funded, state-licensed, or which are on state property. It requires that projects must eliminate, minimize, or mitigate adverse effect to properties listed in the register of historic places. It establishes requirements for review of impacts and a state register of historic places, and establishes coordination with the Historic Preservation Act. It also requires that actions which may impact the historical, architectural, archaeological, or cultural qualities of a listed or unlisted property must be coordinated with the Vermont Historical Commission.

The central tannery building has been removed. If other significant scientific, prehistorical, historical, or archaeological data are encountered during implementation of the alternatives, steps will be implemented to recover, protect, and preserve such data. Native American resources may be present in the site's vicinity. If archaeological resources are encountered during soil excavation, then they would be reviewed by federal and state archaeologists. This requirement is potentially applicable to any excavation on-site.

2.2.3 Action-Specific ARARs

Action-specific ARARs focus on remedial activities occurring within the Site under investigation. These requirements pertain to technology- or activity-based requirements or limitations, including storage, transportation, and disposal methods of hazardous substances as well as construction of facilities or treatment processes which might be implemented at the Site. Federal and state laws that need to be considered when planning and implementing remedial actions at the Site will continue to be developed throughout the Record of Decision (ROD) process. Potential action-specific ARARs and TBCs listed below are revisited during the detailed evaluation of alternatives (Section 5.0).

- Federal CERCLA Five-Year Review

- Federal Water Pollution Control Act, as amended by the Clean Water Act (33 U.S.C. §1251 et seq.), including National Pollutant Discharge Elimination System (NPDES)

- Federal RCRA, as amended (42 U.S.C. §6901 et seq)

- Federal Clean Air Act (42 U.S.C. §7401 et seq.)
- Federal DOT Hazardous Materials Transport Act (HMTA) (49 U.S.C. §1803 et seq.)
- Vermont Air Pollution Control Regulations adopted under 10 V.S.A. Section 551 et seq. (EPR Chapter 5)
- Vermont Waste Management Act , 10 VSA Chapter 159, Hazardous Waste Management Regulations (EPR Chapter 7)
- Vermont Ground water Protection Regulations adopted under 10 VSA Chapter 48 (EPR Chapter 7)
- Vermont Water Quality Standards adopted under 10 VSA Chapter 47 (EPR Chapter 1)
- Vermont Solid Waste Management Rules (EPR Chapter 6)
- Vermont Land Use and Development Law - Act 250 (10 VSA Chapter 151)

CERCLA Five-Year Review: A review of the Site is required every five years, or until contaminant levels allow for unlimited use and unrestricted exposure, after initiation of the remedial action. This review is required by federal statute for any site remedy which results in hazardous substances, pollutants, or contaminants remaining at the sites (CERCLA §121(c); NCP & §300.430 (f)(4)(ii)). Deletion of a site from the NPL does not affect the site's potential need for a five-year review.

The purpose of the five-year review is to: (1) confirm that the remedy as spelled out in the ROD and/or remedial design remains effective at protecting human health and the environment; and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. The focus of the review will depend upon the original goal of the response action.

The level of the review will be determined based on site-specific considerations, including the nature of the response action, the status of on-site response activities, proximity to populated areas and sensitive environmental areas, and the interval since the last review was conducted. Level I is the lowest level of evaluation of protectiveness, Level II is the intermediate level, and Level III is the highest level of evaluation of protectiveness.

National Pollutant Discharge Elimination System and Vermont Water Pollution Control and Permit Regulations: The CWA established the National Pollutant Discharge Elimination System (NPDES) permit program as authorized under CWA (regulated at 40 CFR Part 122). Discharges of wastewater to surface water bodies must comply with NPDES requirements. Designated toxic pollutants are listed in 40 CFR 401.14, General Provisions for Effluent Guidelines and Standards. Under the CWA Section 402, states may become authorized to administer the federal NPDES program and Vermont has such authorization. Toxic pollutants are subject to effluent limitations arising from the application of the best available technology

economically achievable for the application class or point source category. Direct discharges triggering NPDES requirements are listed below.

- Point-source discharge of treated wastewater directly into, or in very close proximity to, a surface water body either on or off a site

- Site-specific water runoff channeled directly to a surface water body via a ditch, culvert, storm sewer, or other means

- Unchanneled, non-point source surface water runoff from a site into surface water

NPDES requirements are applicable to remedial alternatives which generate an effluent requiring discharge to any surface water body, including Hollow Brook and the Hoosic River. The Vermont Water Pollution Control and Permit Regulations (EPR Chapter 13) establish permit requirements for specific discharges into surface waters. The permit program requires that no discharge result in violations of ground water standards or surface water standards but do not set specific effluent limits. The discharge permit program identifies the list of toxic pollutants to be controlled with effluent limitations. Pollutant discharges must comply with NPDES permit requirements. Permit conditions and standards for different classes of water are specified. Permit requirements are not applicable for Superfund sites, but substantive requirements may be relevant and appropriate for any proposed remediation action which involves discharge of treated water to surface water.

Resource Conservation and Recovery Act, Subtitle D and Vermont Solid Waste Management Regulations: The federal role in the RCRA is to establish the overall regulatory direction, by providing minimum standards for protecting human health and the environment, and to provide technical assistance to the states. An important step in determining ARARs or TBC criteria is determining the RCRA status of a disposal area (Subtitle C, Interim Subtitle C, or Subtitle D). Subtitle D applies to non-hazardous (i.e., municipal solid waste) landfills. Subtitle D of RCRA establishes a framework for federal, state, and local government cooperation in controlling the management and disposal of non-hazardous solid wastes. Direct implementation of Subtitle D is largely a state and local function.

Federal requirements for the disposal of non-hazardous solid waste are listed at 40 CFR Part 257, specified as *Criteria for Classification of Solid Waste Disposal Facilities*, and at 40 CFR Part 258 specified as *Criteria for Municipal Waste Landfills*. Part 257 criteria take into account the following: flood plains; endangered species; surface water quality; ground water quality; food-chain crops; disease vectors; air quality; and safety of public and property. Waste disposal practices not meeting these criteria constitute open dumping, which is prohibited under Section 4005 of RCRA. Part 258 criteria establish location restrictions, minimum landfill operating criteria, design criteria, ground water monitoring and corrective actions, closure and post-closure care, and financial assurance criteria. EPA has also issued guidance relative to final solid waste landfill covers, as described in Section 3.0 of this report.

Vermont Solid Waste Management Regulations are found at EPR Chapter 6 and govern solid waste management activities and facilities, including landfills and dumping grounds. The

regulations cover prohibitions on open dumps and dumping grounds; solid waste facility planning; solid waste facility design, operation and closure requirements; and solid waste landfill post-closure use. This includes the capping of any areas designated as contaminated, non-hazardous waste areas. The rules also include a description of gas controls and closure requirements with regard to solid waste facilities, prohibiting methane gas concentrations of greater than 25% of the Lower Explosive Limit (LEL) at the facility property boundary or in facility structures. Design and operational standards include planning, construction, surface and ground water protection, air quality protection, and monitoring requirements. These regulations are relevant and appropriate for remedial activities that include closure or cover of the landfills and disposal areas within the Site, or construction of any new landfill.

RCRA Subtitle D and Vermont solid waste landfill regulations are applicable to the distinct waste disposal areas. However, some of these waste disposal areas are more appropriately handled under Subtitle C, hazardous waste regulations, as discussed below.

Vermont Regulations for Hazardous Waste Management: RCRA regulations (40 CFR Parts 260 through 280), set forth under Subtitle C of the Solid Waste Disposal Act, pertain to the overall management of hazardous wastes. RCRA sets forth criteria for identifying hazardous substances and lists those under its jurisdiction. It also specifies technical standards and administrative requirements that must be met by hazardous waste generators, transporters, and owners and operators of hazardous waste treatment, storage, disposal and recycling facilities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 extended EPA's authority to remedy problems with any environmental media resulting from past waste management activities at RCRA facilities.

Subtitle C of RCRA pertains to overall management of hazardous wastes from generation through ultimate disposal. States are authorized by the EPA on a state-by-state basis to administer Subtitle C. Vermont's base RCRA program is authorized by EPA. For each remedial action for this Site, both state and federal rules would need to be reviewed. The statutory authority for the state program is 10 V.S.A. Chapter 159.

In general, RCRA Subtitle C is applicable if the waste disposed is a listed or characteristic waste under RCRA and was disposed of after November 19, 1980 or the response action constitutes treatment, storage, or disposal, as defined by RCRA (U.S. EPA, 1991b). The Pownal Tannery Site does not meet the federal criteria as a hazardous waste management facility, due to the federal exemption for tannery operations. The State of Vermont, however, did not adopt the tannery exemption, and thus the Vermont Hazardous Waste Management Rules may apply to closure of this facility.

Federal Clean Air Act and Vermont Air Pollution Control Regulations adopted under 10 V.S.A. Section 551 et seq. (EPR Chapter 5): The Clean Air Act, enacted in 1970 and amended in 1977, is the federal statute mandating the prevention and control of air pollution from both stationary and mobile sources. The Clean Air Act (CAA) requires EPA to establish three types of national standards: NAAQS; New Source Performance Standards; and National Emission Standards for Hazardous Air Pollutants. The purpose of the CAA program, which is usually administered by the state, is to obtain and maintain acceptable levels of ambient air quality.

Remedial alternatives which may have an adverse impact on air quality (for example, fugitive dust emissions generated during excavation activities or emissions generated from active soil venting) are subject to restrictions under this Act.

The CAA mandates that states develop State Implementation Plans (SIPs) which regulate emissions from stationary and mobile sources to ensure attainment and maintenance of the NAAQS. The NAAQS establish the allowable ambient concentrations for six priority pollutants (40 CFR Part 50): total suspended particulates; sulfur dioxide; nitrogen oxide; carbon monoxide; ozone; and lead. The NAAQS apply to pollutant concentrations in ambient air, and are not applicable to individual emission sources.

SIP regulations are contained in 40 CFR Parts 51 and 52. The requirements of the state regulations, which are incorporated into the SIP, are designed to achieve the NAAQS standards overall by imposing emission standards and requirements on sources. Vermont Air Pollution Control Regulations define and regulate major and minor sources. Both major and minor sources require source approval and may require a study of health risks. All minor stationary sources are required to apply Best Available Control Technology (BACT) for each pollutant it would have the potential to emit. Major sources of VOCs are required to apply Lowest Achievable Emission Rate (LAER) and obtain offsets.

Federal New Source Performance Standards (NSPS) were developed for over 50 specific industrial categories to provide a ceiling for emissions from new sources. They are based on application of the best available technology to reduce emissions. These standards, which include requirements for notification, record keeping, performance tests, maintenance, and monitoring, are contained in 40 CFR Part 60.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) were established to control air pollutants for which no ambient air quality standards are applicable and which may result in an increase in mortality or serious irreversible illness. Standards in 40 CFR Part 61 define emission limits, monitoring requirements, restrictions on material use, worker practice standards, and reporting requirements for hazardous air pollutants.

Ambient air monitoring methods, detailing reference and equivalent methods approved by EPA for monitoring ambient air pollutants, are contained in 40 CFR Part 53.

The Vermont Air Pollution Control Regulations (EPR 5-261(1) and Appendix C) prohibit emissions of quantities of air contaminants which will cause a condition of air pollution. These rules apply to new or increased emission sources from incinerators, industrial facilities, and power generating facilities. They govern plan approval, and establish emission limits for various processes and regions within the state. The rules also cover dust, odor, construction, and demolition (EPR 5-201). These regulations would be applicable to specific remedial actions which may be considered for the Site.

Department of Transportation Hazardous Materials Transportation Act: The Hazardous Materials Transportation Act (HMTA) provides regulations on the transport of hazardous materials. Under CERCLA Section 306(a), all hazardous substances are listed as hazardous

materials under HMTA. The Department of Transportation (DOT) has promulgated regulations under 49 CFR Parts 171 to 179 governing shipment of hazardous materials, which includes RCRA- and CERCLA- generated hazardous wastes. These rules contain requirements for shipping papers, marking, labeling, packaging, and placarding.

The practical effect of the DOT regulations is to require proper record keeping, use of licensed haulers, and proper transportation equipment. The DOT regulates transport by rail and public highway at 49 CFR Parts 174 and 177, respectively. The DOT also provides shipping container and tank car specifications which are located at 49 CFR Parts 178 and 179, respectively.

If materials that contain hazardous wastes are to be removed from the Site, DOT general manifest requirements would apply.

2.3 Remedial Action Objectives

2.3.1 General Remediation Objectives

General remedial action objectives are defined by the NCP, CERCLA, and amendments, and apply to all Superfund sites. Whereas CERCLA goals relate to statutory requirements for development of the remedy, site-specific goals relate to the site-specific conditions, contaminated media, potential exposure routes, and identified target remediation levels. Site-specific goals require an understanding of the contaminants in the media and are based upon an evaluation of the risks to public health and the environment associated with the site contaminants as discussed before.

The NCP states the national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste (40 CFR, Part 300.430). The statutory scope of CERCLA, as amended by SARA, includes the following general goals for remedial actions at CERCLA sites.

- Refinement of the objectives for the degree of remedial action cleanup in that remedial actions "shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and of control of further releases at a minimum which assures protection of human health and the environment" [Section 121(d)].

- Preference for the selection of remedial actions "in which treatment that permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants is a principal element" [Section 121(b)]. An explanation must be provided if a permanent solution using treatment or recovery technologies is not selected.

- Requirements that the selected remedy comply with or attain the level of any "standard, requirement, criteria, or limitation under any Federal environmental law...or any promulgated standard, requirement, criteria, or limitation under State environmental or facility siting law that is more stringent than any Federal standard, requirement, criteria, or limitation" [Section 121(d)(2)(A)].

Because of the potential hazards at the Pownal Tannery Site associated with contaminated media, site-specific remedial action objectives were developed to comply with these requirements.

2.3.2 Site-Specific Remedial Action Objectives

The site-specific remedial action objectives to mitigate potential adverse effects from exposures to the contaminated waste and soil media at the site are listed below.

- To prevent or reduce human exposure to contaminated soils and waste.
- To prevent or reduce leaching of contaminants from source areas to ground water.
- To protect the environmental receptors.

Remedial action objectives were developed to address human health risks posed by exposure to site contaminants. Soil/sludge, surface water and air in the lagoon areas, soil in the Warehouse area, on-site ground water, ground water from off-site private wells, and Hoosic River surface water and sediment were quantitatively evaluated in the RI human health risk assessment (M&E, 2001). Among these, soil/sludge in the Lagoon Area, Hoosic River sediment and associated wetlands, and on-site/off-site ground water were determined to be of concern with regard to human health.

Note that on-site surface soil/sludge and surface water as well as Hoosic River surface water and sediment were evaluated for potential ecological effects in the Ecological Risk Assessment. The Ecological Risk Assessment determined that exposures in the Hoosic River and Lagoon ponds are of concern with regard to ecological receptors, but EPA has not yet made a determination whether to conduct a Feasibility Study to address those exposures. Consequently, ecological risks are not considered in this report.

EPA guidelines for baseline risks at a Superfund site generally indicate that noncarcinogenic risk should not exceed a total hazard index of one, and that carcinogenic risks should not exceed the target risk range of 10^{-6} to 10^{-4}. RAOs are limited to media, geographic areas, and chemicals for which estimated risk exceeds EPA target risk ranges. The human health risk assessment identified certain media and areas of the site that may pose risks in excess of EPA risk guidelines. These include soil/sludge at Lagoons 1, 3 and 5, sediment within the Hoosic River, off-site ground water (private wells RW-003, RW-006, RW-008 and RW-010) and on-site ground water (monitoring wells MW-104U, MW-106U, MW-107R, MW-107U, MW-109U, MW-110R, MW-110U, MW-111U, MW-113R, MW-114U, MW-B-7, MW-L-3 and MW-L-10).

Soil at the Warehouse Area, surface water in the Hoosic River, air in the Lagoon Areas, ground water in all other private and monitoring wells were evaluated in the human health risk assessment and were considered not to pose a significant risk to human health. Estimated risks from Warehouse Area soil, Hoosic River surface water, Lagoon Area air and other private and monitoring wells did not exceed a hazard index of one or a cancer risk of 10^{-6} to 10^{-4}. Therefore, because the only media for which risks exceed EPA target risk ranges are soil/sludge, sediment and ground water, RAOs were identified for only these three media (see Appendix J).

The human health RAOs for the Site include specific objectives to reduce risks identified in the baseline risk assessment as above EPA guidelines. RAOs relevant to protection of human health at the site are listed below.

- Soil/sludge - Prevent exposure to soil/sludge COCs at levels in excess of the EPA target risk range of 10^{-6} to 10^{-4} for carcinogenic compounds and the target hazard index of one for noncarcinogenic compounds with similar toxicity endpoints.

- Soil/sludge - Prevent ingestion of the lead in Lagoon 1 soil/sludge that results in estimated blood lead levels of greater than 10 μg/dL, a site-specific level protective of childhood exposures.

- Sediment - Prevent exposure to sediment COCs at levels in excess of the EPA target risk range of 10^{-6} to 10^{-4} for carcinogenic compounds and the target hazard index of one for noncarcinogenic compounds with similar toxicity endpoints.

- Ground water - Prevent ingestion of ground water contamination in excess of chemical-specific drinking water ARARs or, in the absence of ARARs, in excess of the EPA target risk range of 10^{-6} to 10^{-4} for carcinogenic compounds and the target hazard index of one for noncarcinogenic compounds with similar toxicity endpoints.

2.4 Site-Specific Remedial Action Goals

CERCLA requires selection of a remedial action that is "protective of human health and the environment." The EPA approach to determining an acceptable level of protection (i.e., cleanup levels) is based upon the following.

- Existing ARARs and TBCs that define acceptable levels of exposure.

- Results of the baseline risk assessment and evaluation of existing and residual risks for remedial alternatives.

In the following subsections remedial action goals are developed to meet the established site-specific remedial objectives. The remedial action goals to meet these objectives were developed for each area of the site.

The human health risk assessment evaluated potential exposures to contaminated media at the site, based on current and projected future land use. Current use includes light recreational usage of the site and river/wetland areas in the vicinity of the site, and residential use of land surrounding the site. Future use may include residential development of portions of the site (i.e. the Warehouse Area) as well as the surrounding area, industrial/commercial use of the site, and/or use of the site for active park/recreational use. Ground water in the area is currently used as a source of drinking water, which is assumed to continue in the future. Exposure assumptions used in the RI report were maintained for the calculation of PRGs (see Appendix J).

Where there are established ARARs for chemical-specific concentrations (e.g., ground water Maximum Contaminant Levels), these are selected as PRGs. According to U.S. EPA guidance For *Development of Risk-based Preliminary Remediation Goals* (U.S. EPA, 1991c), it is appropriate to develop PRGs for site media with cumulative cancer risks greater than 10^{-4} or hazard indices greater than one, except for media with clearly defined ARARs. Within these media, PRGs are appropriate for each chemical with cumulative cancer risks above 10^{-6} or with a hazard index above one. Manganese in ground water which lacks an MCL, sediment COCs and COCs (including lead) in soil/sludge are eligible for risk-based PRGs based on this guidance. In each of the site media of human health concern, risk-based PRGs are calculated using current toxicity data (see Appendix J). Risk-based PRGs are calculated for all analytes for which risks estimated in the RI contribute substantially to total risks above RAOs.

2.4.1 Soil Preliminary Remediation Goals

Table 2.4-1 presents the Human Health Preliminary Remediation Goals (PRGs) for soil.

Table 2.4-1: Human Health Preliminary Remediation Goals for Soil

Benzo(a)anthracene	1.7 mg/kg
Benzo(a)pyrene	0.17 mg/kg
Pentachlorophenol	7.7 mg/kg
N-Nitroso-di-n-propylamine	0.27 mg/kg
Arsenic	1.1 mg/kg
Chromium	733 mg/kg
Lead	1000 mg/kg
Mercury	23.0 mg/kg
Dioxin TEQ	11.0 ng/kg

The PRG for lead in soil/sludge was developed to protect a future young child park visitor. The PRG was developed based on the methodology described in EPA's *Integrated Exposure Uptake Biokintic Model (IEUBK) for Lead in Children* (U.S. EPA, 1994). The PRG is based on the site-specific childhood blood lead level of 10 µg/dL, developed in the RI risk assessment as a level protective of 95% of children.

The soil/sludge PRGs for other COCs shown in Table 2.4-1 are based on use of the site as a future park. The goals are based on the more stringent of a $1x10^{-6}$ excess cancer risk or a hazard index of one. Since multiple contaminants are present, the combined excess cancer risk should be in the range of 10^{-6} to 10^{-4}, and the combined hazard index should be less than 10. The methodology used in determining the soil/sludge risk-based goals is presented below.

Risk-based PRGs were developed for soil/sludge to protect a potential future child/adult park visitor who might use the Lagoons 1, 3 or 5 as a recreational area. The equations shown below were used to derive risk-based PRGs for soil/sludge for carcinogenic and non-carcinogenic effects.

CARCINOGENIC EFFECTS

$$C\ (mg/kg) = \frac{TR \times AT \times 365\ days/year \times 10^{6}\ mg/kg}{EF \times [(IFS \times TOX) + (SFS \times ABS \times TOX)]}$$

where:

C	=	Chemical concentration in soil/sludge
TR	=	Target risk: target excess lifetime cancer risk (for carcinogenic effects) of 10^{-6}
AT	=	Averaging time for carcinogens (70 years)
EF	=	Exposure frequency (112 days/year)
IFS	=	Age-adjusted ingestion factor for soils for ages 1-30 (114 mg-yr/kg-day)
TOX	=	Toxicity value, which is chemical-specific for carcinogens. Carcinogens are measured as oral slope factor $(mg/kg\text{-}day)^{-1}$.
SFS	=	Age-adjusted dermal factor for ages 1-30 (360 mg-yr/kg-day)
ABS	=	Fraction absorbed across skin, unitless and chemical specific

NONCARCINOGENIC EFFECTS

$$C\ (mg/kg) = \frac{TR \times BW \times AT \times 365\ days/year \times 10^{6}\ mg/kg}{EF \times ED \times [(TOX \times IR^{s}) + (TOX \times SA \times AF \times ABS)]}$$

where:

C	=	Chemical concentration in soil/sludge
TR	=	Target risk: target hazard index of 1
BW	=	Young child body weight (15 kg)
AT	=	Averaging time for noncarcinogens (30 years)
EF	=	Exposure frequency (112 days/year)
ED	=	Exposure duration (6 years)
TOX	=	Toxicity value, which is chemical-specific for noncarcinogens. Noncarcinogens are measured as 1/reference dose (RfD) (mg/kg-day).
IR^{s}	=	Daily soil ingestion rate (200 mg/day)
SA	=	Exposed surface area (2800 cm^2)
AF	=	Skin adherence factor (0.3 mg/cm^2)
ABS	=	Fraction absorbed across skin, unitless and chemical specific

2.4.2 Ground Water Preliminary Remediation Goals

Table 2.4-2 shows the proposed risk-based and/or standards based PRGs corresponding to the ground water RAOs. The target individual selected to represent exposure to ground water was a current/future resident who may ingest ground water 350 days a year for 30 years. The chemicals for which cleanup is indicated are those chemicals of concern (identified in the RI report) for which a cleanup level is below the maximum concentration detected in a particular area of the Site.

Table 2.4-2: Human Health Preliminary Remediation Goals for Ground Water	
Carbon tetrachloride	5 ug / L
Methylene chloride	5 ug / L
Heptachlor epoxide	0.2 ug / L
Dioxin TEQ	0.00003 ug / L
Arsenic	10 ug / L
Manganese	840 ug / L
Thallium	2 ug / L
1,4-dichloroethene	15 ug / L
Tetrachloroethene	5 ug / L
Atrazine	3 ug / L

The ground water PRGs shown in Table 2.4-2 is based on use of the aquifer as a potential drinking water source. Final MCLs and non-zero Maximum Contaminant Level Goals (MCLGs) developed under the Safe Drinking Water Act are used to establish PRGs for ground water. If no MCLs or non-zero MCLGs are available, the goals are based on the more stringent of a $1x10^{-6}$ excess cancer risk or a hazard quotient of one. Since multiple contaminants are present, the combined excess cancer risk should be in the range of 10^{-6} to 10^{-4}, and the combined hazard index should be less than 10. The methodology used in determining the ground water risk-based goals is presented below.

Risk-based PRGs were developed for ground water to protect a potential future resident who might use ground water as a drinking water source. The equation shown below was used to derive risk-based PRGs for ground water:

$$C\ (\mu g/L) = \frac{TR \times BW \times AT \times 365\ days/year \times 1000\ \mu g/mg}{EF \times ED \times TOX \times IR^{w}}$$

where:

C	=	Chemical concentration in water
TR	=	Target risk: target excess lifetime cancer risk (for carcinogenic effects) of 10^{-6} and target hazard index (for noncarcinogenic effects) of 1
BW	=	Adult body weight (70 kg)
AT	=	Averaging time for carcinogens (70 years) and noncarcinogens (30 years)
EF	=	Exposure frequency (350 days/year)

ED = Exposure duration (30 years)
TOX = Toxicity value, which is chemical-specific for both carcinogens and noncarcinogens. Carcinogens are measured as oral slope factor $(mg/kg\text{-}day)^{-1}$ and noncarcinogens are measured as 1/reference dose (RfD) (mg/kg-day).
IR^W = Daily water ingestion rate (2 L/day)

2.4.3 Sediment Preliminary Remediation Goals

Table 2.4.3 presents the Human Health PRGs for sediment.

Table 2.4-3: Human Health Preliminary Remediation Goals for Sediment

PCBs	2.1E-5 mg/kg
Dioxin TEQ	1.5E-5 mg/kg
Arsenic	2.1 mg/kg

The sediment PRGs for COCs shown in Table 2.4-3 are based on use of the site and a future park. The goals are based on the more stringent of a $1x10^{-6}$ excess cancer risk or a hazard quotient of one. Since multiple contaminants are present, the combined excess cancer risk should be in the range of 10^{-6} to 10^{-4}, and the combined hazard index should be less than 10. The methodology used in determining the sediment risk-based goals is presented below.

Risk based PRGs are developed for sediment to protect a potential future child/adult park visitor who might use the Hoosic River and wetlands as a recreational area. The equations shown below were used to derive risk based PRGs for sediment for carcinogenic and non-carcinogenic effects.

$$C\,(mg/kg) = \frac{TR \text{ x } AT \text{ x } 365\,\text{days/year} \text{ x } 1000\,mg/kg}{EF \text{ x } \left[(IFS \times TOX) + (SFS \times ABS \times TOX)\right]}$$

where:

C = Chemical concentration in sediment
TR = Target risk: target excess lifetime cancer risk (for carcinogenic effects) of 10^{-6} and target hazard index (for noncarcinogenic effects) of 1
BW = Adult body weight (70 kg)
AT = Averaging time for carcinogens (70 years)
IFS = Age-adjusted ingestion factor for sediments for ages 1-30 (114 mg-yr/kg-day)
EF = Exposure frequency (60 days/year)
TOX = Toxicity value, which is chemical-specific for both carcinogens and noncarcinogens. Carcinogens are measured as oral slope factor $(mg/kg\text{-}day)^{-1}$ and noncarcinogens are measured as 1/reference dose (RfD) (mg/kg-day).
ABS = Fraction absorbed across skin, unitless and chemical specific
SFS = Age-adjusted dermal factor for ages 1-30 (360 mg-yr/kg-day)

2.4.4 Uncertainty

Much of the uncertainty in the health risk assessment also applies to the human health PRGs, since the PRG development is based on chemicals, media, and areas of concern identified in the RI. Also, the PRGs were developed using the same exposure assumptions and parameters. As a result, the following significant sources of uncertainty apply to the derivation of the PRGs.

- Identification of chemicals, media, and areas of concern
- Fate and transport assumptions
- Dose-response relationships for individual chemicals
- Toxicity interaction between chemicals
- Exposure scenario development
- Target population characteristics

A large number of soil/sludge, sediment and ground water samples at the site were analyzed for numerous chemicals. The chemicals identified as of potential concern in soil/sludge, sediment and ground water are likely to be representative of the toxicity in these media. Dose-response uncertainty is common to all hazardous waste risk assessments. There are many uncertainties regarding the amount of time people spend visiting the site or working outdoors in the site, and about how much contact there will be in the future.

2.5 General Response Actions for Soils and Sludges

General response actions are those remedial actions that satisfy the RAOs. General response actions for the contaminated media at the Pownal Tannery site were formulated based on the results of the Remedial Investigation and the Human Health and Ecological Risk Assessments.

Table 2.5-1 lists general response actions for the site.

Table 2.5-1: General Response Actions

Environmental Medium	General Response Action
Soil/sludges	No Action Institutional Control Containment Removal Disposal Ex-situ Treatment In-situ Treatment

The general response actions listed above represent only actions that would be applied directly to contaminated soil/sludges at the site. Additional remedial activities (such as wetland replacement, backfilling, etc.) are considered part of the remedial actions listed above. These additional remedial activities are identified and evaluated in the alternative development, initial screening and detailed analysis sections that follow.

The primary identified unacceptable risks are associated with dermal contact and incidental ingestion of contaminants associated with these materials under a future recreational (park visitor) and commercial (worker) development scenario. Thus, the identified response actions for soil/sludges are directed at reducing or eliminating this risk. A brief description of the general response actions is provided below.

2.5.1 No Action

The No Action general response action will be considered throughout each phase of the FS, as required by the NCP. It involves no actions to limit future exposures to human health and/or the environment. No institutional controls or monitoring would be conducted as part of a No Action alternative.

2.5.2 Institutional Controls

Institutional controls involve steps that could be taken to limit the potential for exposure to contaminated media. Institutional controls for the Pownal Tannery site would include limiting potential future site uses (i.e., land use restrictions) and limiting site access (e.g., fencing). Institutional controls are typically implemented in conjunction with other remedial components, and not as a stand-alone remedy.

2.5.3 Containment

Containment involves the physical isolation of contaminated soils and/or sludges. The most obvious containment technology for the Pownal Tannery site would include capping which could isolate or immobilize contaminated materials with or without treatment, thereby, limiting the potential exposure to, and mobility of, contaminants.

2.5.4 Removal Actions

Removal involves the excavation of contaminated soils and sludges by conventional techniques and is implemented in conjunction with other remedial components. The type of equipment used for excavation depends on proposed excavation volume(s) and depth(s). Contaminated soils and sludges for the site could be excavated with conventional construction equipment such as backhoes, excavators, front-end loaders, etc. As contaminated materials are excavated, they could be transferred to trucks or a temporary storage area, preferably a diked or bermed area lined with plastic or low-permeability clay. If excavation of saturated zone soils is necessary, dewatering can be performed by the use of pumps to lower the water table to facilitate removal activities, or the excavation can be performed without dewatering ("in the wet"). Excavation of saturated soils would require the construction of dewatering pads to allow the soils to drain prior to further remedial activities.

2.5.5 Disposal

Disposal is the placement of material following removal into an on-site or off-site structure or facility in order to isolate contaminants from human and ecological receptors to prevent adverse

health or environmental effects. Depending on the type of on-site disposal, the excavated material may undergo treatment. Off-site disposal options vary depending on the chemical characteristics of the excavated material (e.g., dioxin concentrations) and the degree and type of treatment of the material prior to disposal.

2.5.6 In-Situ Treatment

In-situ treatment may be used to reduce contaminant concentrations without the removal or containment of contaminated soil/sludges. In-situ treatment technologies that may be considered for the site include numerous physical, chemical and biological treatment options. Examples include soil washing, physical separation, Solidification/Stabilization, chemical extraction and oxidation/reduction.

2.5.7 Ex-Situ Treatment

Ex-situ treatment technologies may be employed following removal of contaminated soil/sludges. Examples include numerous physical/chemical and biological treatment options (some are mentioned above), as well as thermal treatment technologies. Treated materials may be disposed of on land after treatment to meet disposal criteria (including reuse as on-site backfill).

2.6 General Response Actions for Ground Water

Based on the very low concentrations of contaminants in ground water noted in the Remedial Investigation, EPA directed TRC to consider only long-term monitoring as a General Response Action for ground water. A summary of the rationale is presented below.

Field Contamination in Ground Water: Several ground water samples from one round of sampling contained methylene chloride at concentrations that exceed the MCL. However, methylene chloride does not appear to be site related, for the reasons discussed below.

- Methylene chloride was only detected during one round of ground water sampling. Methylene chloride was not detected in other sampling rounds prior to or since that round of sampling.

- Methylene chloride was also detected in the field rinseate blank from that sampling event.

- There is no other explainable pattern to the location of wells where methylene chloride was detected and it does not appear to be associated with any particular known release area.

Manganese in Bedrock Ground Water: Manganese was detected in all of the ground water monitoring wells and private drinking water wells. It does not appear that Manganese in the bedrock wells is site related, as discussed below.

- Except at one location in the Former Tannery Area, the bedrock aquifer is approximately 100 feet deep and is separated from the shallow, water-table aquifer by a thick (>50 feet) layer of

low-permeability clay. This clay layer acts as a barrier for migration of any contaminants that are present in the shallow water table aquifer.

- The vertical hydraulic gradients between the bedrock and overburden aquifers in the release areas are upward. These hydraulic forces further reduce the possibility that contaminants from the water table aquifer could migrate vertically downward into the bedrock.

- Manganese was detected in bedrock wells that are upgradient of the site. The distribution of Manganese in bedrock wells at the site suggests that the bedrock itself is the source of the Manganese in the bedrock aquifer.

Contaminants below MCL: Several contaminants were identified as significant contributors to risk, but only one contaminant was identified at a concentration that exceeds the MCL. The only MCL exceedance was observed in well MW-109U, in one of four sampling events, where Thallium was present at a concentration of 7.5 ppm versus the MCL of 2 ppb. Other contaminants that contributed to risk, but were not identified at a concentration above the MCL include arsenic, Dioxin (TEQ), heptachlor epoxide and carbon tetrachloride.

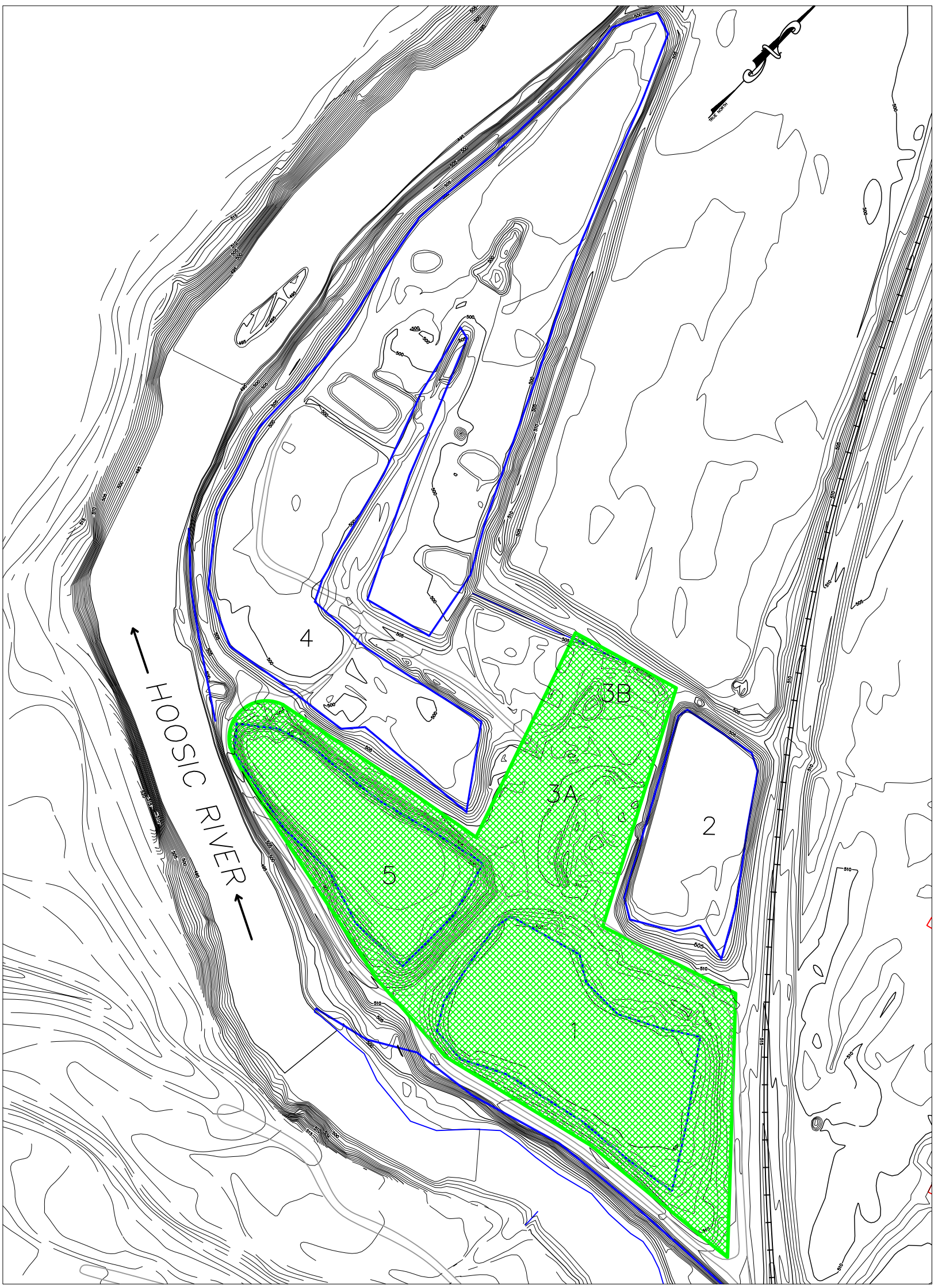
2.7 Volume of Media Requiring Remediation

Figure 2.7-1 shows the location and approximate areas of soils potentially requiring remediation, based on the PRGs in Table 2.4-1.

Table 2.7-1 presents a listing of estimated volumes of contaminated soil/sludges. Appendix B presents the methodology used to calculate these volumes.

Table 2.7-1: Estimated Volume of Contaminated Soil Requiring Remedial Action

Media	Volume (CY)
Saturated Sludge	
Lagoon 1	18,700
Lagoon 2	0
Lagoon 3	4,400
Lagoon 4	1,400
Lagoon 5	6,600
Total	**31,100**
Unsaturated Sludge/Soils	
Lagoon 1	8,700
Lagoon 2	0
Lagoon 3	7,000
Lagoon 4	900
Lagoon 5	0
Soils Berms	25,900
Total	**42,500**
GRAND TOTAL	**73,600**



LEGEND

0 40 80 120 160

SCALE IN FEET

AREA REQUIRING REMEDIATION

Wetland Delineation

1 LAGOON REFERENCE NUMBER

J:\OPROJECTS\POWNAL\FIGURES\LANDFILL OPTIONS\REQUIREREM.DWG

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0220-01N93

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACTOR NO.: 107061

FIGURE 2.7-1
AREAS REQUIRING REMEDIATION

POWNAL TANNERY
POWNAL, VERMONT

Metcalf & Eddy